

मत्स्य आहार — विशिष्टि

भाग 1 कार्प आहार

(पहला पुनरीक्षण)

Fish Feed — Specification

Part 1 Carp Feed

(First Revision)

ICS 67.120.30

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Price Group 7

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Fish, Fisheries and Aquaculture Sectional Committee had been approved by the Food and Agriculture Divisional Council.

Aquaculture is making a rapid progress within the country. A large number of aquaculture farms have been established where aquaculture has been undertaken on scientific lines. It is important that for the production of good quality fish at minimum cost, the fishes are properly fed so as to meet their nutritional requirements. To keep pace with the development of aquaculture, the manufacture of fish feeds and their marketing has also commenced in the country.

This standard was first published in 2014 with a view to enable the manufacturers to prepare fish feeds of known quality. This first revision is being brought about to address changes in feed manufacturing practices and regulatory requirements. In this revision, the nutrient requirements are given for six different physiological stages (carp larval feed, carp nursery feed, Carp starter feed, Carp grower feed, carp finisher feed and carp brood stock feed) as per the practice followed in the farming and the feed types available. The nutrient requirement from larvae to brood stock has been considered and the total package of feeds to cater to the needs for the whole life cycle has been considered. Accordingly the feed size and form has been revised. Similarly, the nutrient contents and aflatoxin B1 limits have been revised based on national and global best practices. The requirement on usage of antibiotics has been modified to prohibit their usage altogether. In addition, some new ingredients and additives are included for use in carp feed formulations. It is expected that this standard would be of assistance to the rapidly developing aquaculture and fish feed manufacturing industry.

The composition of the Committee responsible for formulation of the standard is given in Annex E and considerable assistance has been provided by ICAR - Central Institute of Brackishwater Aquaculture, Chennai in development of this standard.

This is one among the series of Indian Standards formulated to ensure availability of feeds of suitable quality for fish. The other Parts of the standard are as follows:

- a) Part 2 Catfish feed;
- b) Part 3 Marine shrimp feed;
- c) Part 4 Freshwater prawn feed; and
- d) Part 5 *Pangasius* feed.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard***FISH FEED — SPECIFICATION****PART 1 CARP FEED***(First Revision)***1 SCOPE**

1.1 This standard (Part 1) prescribes the requirements and the methods of sampling and test for Indian major carp (*Catla catla*, *Labeo rohita* and *Cirrihina mrigala*) feeds.

1.2 These feed requirements are intended for carps cultured in earthen pond with considerable natural productivity and the feeds recommended are of supplementary nature only.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 TYPES

Carp feed shall be of the following six types:

- a) Carp Larval Feed (CLF) — feed to be fed to carp larvae up to age of 15 days/25 mm length.
- b) Carp Nursery Feed (CNF) — feed to be fed to carp fry from 16th day to 90th day/ 25 mm -100 mm length.
- c) Carp Starter Feed (CSF)— feed to be fed to carp fingerlings from 5 g to 100 g in size
- d) Carp Grower Feed (CGF) — feed to be fed to carp from 100 g to 500 g
- e) Carp Finisher Feed (CFF) — feed to be fed to carp from 500 g to harvesting
- f) Carp Brood Feed (CBF) — feed to be fed to brood carp before 4 months of onset of breeding.

4 REQUIREMENTS**4.1 Description**

The carp feed shall be free from rancidity, adulterants, moulds and insect infestation.

4.1.1 Ingredients

The ingredients listed in Annex B shall only be used for manufacturing carp feed.

4.2 Physical Characteristics**4.2.1 Feed Form and Size**

4.2.1.1 Carp larval feed shall be in the form of powder or granules of size less than or equal to 500 µm.

4.2.1.2 Carp nursery feed shall be in the form of crumbles or pellets of 500-1500 µm diameter.

4.2.1.3 Carp starter feed shall be in the form of pellets of 1.5 mm-3 mm diameter.

4.2.1.4 Carp grower feed shall be in the form of pellets of 3 mm to 5 mm diameter.

4.2.1.5 Carp finisher feed shall be in the form of pellets of 4 mm to 6 mm diameter.

4.2.1.6 Carp brood feed shall be in the form of pellets of 4 mm to 6 mm diameter.

4.2.2 Water Stability of Pellets

The feed pellets shall be stable without disintegration in water for 30 minutes minimum. The water stability shall not be less than 80 percent after 20 minutes when tested as per Annex C.

4.3 The carp feed shall also conform to the requirements given in Table 1.

Table 1 Requirements for Carp Feed
(Clauses 4.3 and 7.1)

Sl No.	Characteristic	Requirements						Method of Test, Ref to
		CLF (3)	CNF (4)	CSF (5)	CGF (6)	CFF (7)	CBF (8)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Moisture, percent by mass, <i>Max</i>	12	12	12	12	12	12	IS/ISO 6496* or 4 of IS 7874 (Part 1)
ii)	Crude Protein (N × 6.25), percent by mass, <i>Min</i>	35	35	26	22	20	25	IS/ISO 5983 : Part 1* or IS/ISO 5983 : Part 2 or 5 of IS 7874 (Part 1)
iii)	Crude fat, percent by mass, <i>Min</i>	6	6	4	4	3	6	IS/ISO 6492 or 7 of IS 7874 (Part 1)*
iv)	Crude fibre, percent by mass, <i>Max</i>	6	6	8	8	10	8	IS/ISO 6865 #
v)	Acid insoluble ash, percent by mass, <i>Max</i>	2.5	3	3	3	3	3	IS 14826 or 10 of IS 7874 (Part 1)*
vi)	Gross energy, kcal/kg, <i>Min</i>	3 400	3 400	3 000	2 800	2 700	2 900	Annex D

NOTES

- 1 The values for requirements specified at sl. no. (ii) to (vi) are on moisture-free basis.
- 2 For routine analysis, the characteristics at sl. No. (ii) to (v) may be tested by near infrared-analyzer.
- 3 In case of dispute, the methods indicated by '*' shall be the referee method.
- 4 The standard includes both manual and semi-automatic procedure. In case of any dispute, manual method given in standard shall be the referee method.

4.4 Antibiotics and Additives

No antibiotics or pharmacologically active substances shall be incorporated in Carp fish feed.

4.5 Aflatoxin B1 content of the carp feed shall not exceed 0.02 mg/kg at the time of manufacture. Aflatoxin B1 shall be tested by the manufacturer in accordance with the test method prescribed in IS 13427 or IS 14718¹⁾ and declared on the label. Sampling of carp feed for estimation of aflatoxin B1 content shall be done in accordance with IS 13426.

NOTE — ¹⁾ In case of any dispute, the test method given in IS 14718 shall be the referee method.

5 PACKING AND MARKING**5.1 Packing**

The material shall be packed in clean, dry and polythene lined bags/ jute bags/ laminated paper bags/ HDPE bags/ PP bags. The mouth of each bag shall either be machine stitched or rolled over and hand stitched.

5.2 Marking

5.2.1 Each bag shall be suitably marked so as to give the following information legibly:

- a) Name of the material and brand name, if any;
- b) Type of the fish feed;
- c) Name and address of the manufacturer;
- d) Net quantity when packed;
- e) Batch or Code number;
- f) Date of manufacture (MM/YY);
- g) Best before (MM/YY); and
- h) Any other markings required under the Legal Metrology (Packaged Commodities) Rules, 2011.

5.2.2 In addition to the information listed in 5.2.1, each bag shall have a label or tag attached to it or contain a leaflet giving the following information:

- a) Type of the fish feed;
- b) Name and quantity of the additives added, if any;
- c) Moisture content;
- d) Crude protein content;
- e) Crude fibre content;
- f) Crude fat content;
- g) Aflatoxin B1 content;
- h) Gross energy; and
- j) Directions for use.

5.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

6 SAMPLING

Representative samples of the material shall be drawn according to the method prescribed in IS 1374.

7 TESTS

7.1 Tests shall be carried out as prescribed in **4.3** and **4.2.2**.

8 QUALITY OF REAGENTS

Unless specified otherwise, pure chemicals and distilled water (see IS 1070) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities, which affect the result of analysis.

ANNEX A
(Clause 2)
LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
IS 920 : 1972	Specification for common salt and cattle licks for animal consumption (<i>first revision</i>)	IS 3591 : 1985	Specification for solvent-extracted coconut oilcake (meal) as livestock feed ingredient (<i>second revision</i>)
IS 1070 : 1992	Reagent grade water — Specification (<i>third revision</i>)	IS 3592 : 1985	Specification for solvent extracted decorticated cottonseed oilcake (meal) as livestock feed ingredient (<i>second revision</i>)
IS 1162 : 2021	Cane molasses — Specification (<i>first revision</i>)	IS 3593 : 1979	Specification for solvent extracted rice bran as livestock feed (<i>second revision</i>)
IS 1374 : 2007	Poultry feeds — Specification (<i>fifth revision</i>)	IS 3648 : 1975	Specification for rice bran as livestock feed (<i>first revision</i>)
IS 1712 : 1982	Specification for cottonseed oilcake as livestock feed ingredient (<i>second revision</i>)	IS 4193 : 1986	Specification for guar meal as livestock feed ingredient (<i>first Revision</i>)
IS 1713 : 1986	Specification for decorticated groundnut oilcake as livestock feed ingredient (<i>second revision</i>)	IS 4307 : 1983	Specification for fishmeal as livestock feed ingredient (<i>second revision</i>)
IS 1932 : 1986	Specification for mustard and rapeseed oilcake as livestock feed ingredient (<i>second revision</i>)	IS 5065 : 1986	Specification for meat meal as livestock feed ingredient (<i>first revision</i>)
IS 1934 : 2016	Sesamum oilcake as livestock feed ingredient — Specification (<i>second revision</i>)	IS 5470 : 2002	Dicalcium phosphate, animal feed grade — Specification (<i>first revision</i>)
IS 1942 : 1968	Specification for bone-meal as livestock feed supplement (<i>first revision</i>)	IS 5862 : 1970	Specification for solvent extracted nigerseed oilcake (meal) as livestock feed
IS 2151 : 1985	Specification for maize germ oilcake as livestock feed ingredient (<i>first revision</i>)	IS 5983 : Part 1 : 2005 / ISO 5983 : Part 1 : 2005	Animal feeding stuffs — Determination of nitrogen content and calculation of crude protein content: Part 1 Kjeldahl method
IS 2152 : 2013	Maize gluten as livestock feed ingredient — Specification (<i>second revision</i>)	Part2 : 2005 / ISO 5983 : Part 2 : 2005	Animal feeding stuffs — Determination of nitrogen content and calculation of crude protein content: Part 2 Block digestion steam distillation method
IS 2154 : 2014	Coconut oilcake as livestock feed ingredient — Specification (<i>third revision</i>)		
IS 3441 : 1982	Specification for solvent extracted groundnut oilcake (meal) as livestock feed ingredient (<i>first revision</i>)		

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
IS 6242 : 1985	Specification for solvent extracted undecorticated safflower oilcake as livestock feed ingredient (<i>first revision</i>)	IS 7874 (Part 1) : 1975	Methods of tests for animal feeds and feeding stuffs: Part 1 General methods
IS 6492 : 1999 / ISO 6492 : 1999	Animal feeding stuffs — Determination of fat content	IS 13426 : 1992	Animal feeds and feeding stuffs — Methods of sampling for aflatoxin analysis
IS 6496 : 1999 / ISO 6496 : 1999	Animal feeding stuffs — Determination of moisture and other volatile matter content	IS 13427 : 1992	Animal feeds and feeding stuffs — Determination of aflatoxin B1 content
IS 6865 : 2000 / ISO 6865 : 2000	Animal feeding stuffs — Determination of crude fibre content — Method with intermediate filtration	IS 14718 : 1998	Animal feeding stuffs — Determination of aflatoxin B1 content of mixed feeding stuffs — Method using high performance liquid chromatography
IS 7060 : 1973	Specification for blood meal as livestock feed	IS 14826 : 2021 / ISO 5985 : 2002	Animal feeding stuffs — Determination of ash insoluble in hydrochloric acid (<i>first revision</i>)

ANNEX B
(Clause 4.1.1)
INGREDIENTS FOR CARP FEED

B-1 In the compounding of carp feed a variety of ingredients are used. This Annex gives a list of such ingredients.

B-1.1 Grain and Seeds

- a) Maize;
- b) Barley;
- c) Bajra;
- d) Wheat;
- e) Jowar;
- f) Oats;
- g) Ragi; and
- h) Rice/broken rice.

B-1.2 Grain By-Products

- a) Rice bran or solvent extracted rice bran and polishings (see IS 3648 and IS 3593);
- b) Wheat bran;
- c) Maize gluten and maize (see IS 2152);
- d) Grain sievings; and
- e) Corn gluten.

B-1.3 Oil Cakes and Meals

- a) Copra cake, coconut oilcake (expeller-pressed or solvent extracted) (see IS 2154 and IS 3591);
- b) Cottonseed oilcake (decorticated) (expeller pressed or solvent extracted) (see IS 1712 and IS 3592);
- c) Groundnut oilcake (expeller — pressed or solvent extracted) (see IS 1713 and IS 3441);
- d) Maize germ oilcake (see IS 2151);
- f) Mustard and rapeseed oilcake (see IS 1932);
- g) Neemseed kernel cake;
- h) Salseed meal, solvent extracted;
- j) Safflower (*Canthamus tinctorius*) oilcake (expeller-pressed or solvent extracted) (see IS 6242);
- k) Sesame (*Sesamum indicum orientale*) oilcake (expeller-pressed or solvent extracted) (see IS 1934);
- m) Soyabean meal (solvent extracted);
- n) Sunflower oilcake (decorticated or undecorticated);
- p) Niger seed oilcake (see IS 5862);
- q) Palm kernel meal;

- r) Dried distillery grains with solubles (DDGS)
- s) Detoxicated jatropha meal
- t) Detoxicated Mahua oil cake

B-1.4 Tubers and Roots

- a) Tapioca flour

B-1.5 Animal Products

- a) Blood meal (see IS 7060);
- b) Fish meal (see IS 4307);
- c) Liver residue;
- d) Meat meal (see IS 5065) and meat scrap;
- e) Meat-cum-bone meal;
- f) Fish viscera meal;
- g) Chicken viscera meal;
- h) Silk worm pupae meal;
- j) Shrimp and shrimp head meal;
- k) Mollusc meat meal;
- m) Bone meal (see IS 1942);
- n) Insect meal;
- p) Fish protein hydrolysate;
- q) Squid liver paste; and
- r) Krill meal.

B-1.6 Oils and Fats

- a) Fish oil/ Squid liver oil;
- b) Edible vegetable oils;
- c) Tallow; and
- d) Insect oil.

B-1.7 Minerals and Vitamins

- a) Dicalcium phosphate (see IS 5470), Mono Calcium Phosphate (see IS 5470), Mono sodium phosphate, Mono potassium phosphate, Mono ammonium phosphate
- b) Common salt (see IS 920); and
- c) Vitamins (mineral stabilized).

B-1.8 Industrial By-Products

- a) Brewers' grain;
- b) Dried yeast and yeast sludge;
- c) Molasses (see IS 1162); and
- d) Dried distillery grains with solubles (DDGS)

B-1.9 Other Ingredients

- a) Dunaliella;

- | | |
|----------------------|---|
| b) Antifungals; | f) Organic acids; |
| c) Peptiglycans; | g) Guar meal (<i>see</i> IS 4193); and |
| d) β -glucans; | h) Spirulina meal; and |
| e) Fuccoidan; | j) Seaweed meal. |

ANNEX C
(*Clause 4.2.2*)

DETERMINATION OF WATER STABILITY OF CARP FEED PELLETS

C-1 PRINCIPLE

Water stability of dry carp feed pellets is determined by the loss in mass of pellets kept in water for a specified time interval. The loss in mass of pellets indicates the stability, higher the loss poorer the stability.

C-2 APPARATUS

- C-2.1 Oven**
- C-2.2 Nylon Mesh**
- C-2.3 Sieve (2.4 mm)**
- C-2.4 Balance**
- C-2.5 Glass Beaker (1 L)**
- C-2.6 Stop Watch**

C-3 PROCEDURE

Wash cone shaped pouches made of nylon mesh (1 mm mesh size) thoroughly and dry at 70 °C to

constant mass in an oven. Take about 2 g of feed pellets in each pouch and record exact initial mass. Take 5-6 such pouches for each sample. Place the pouches with feed pellets at the bottom of 1 litres beaker containing 1 litres distilled water. Record water temperature. After prescribed time, slowly take out pouches with pellets out of the water. Examine the pellets for their physical shape. Dry the pouches with pellets at 70 °C to constant mass. Difference in the initial mass and final mass of the pellets gives loss in mass at 70 °C.

C-4 CALCULATION

Water stability is calculated using the following formula:

$$\text{Percent Water Stability} = \frac{\text{Final mass (g)} \times \text{Percent dry matter}}{\text{Initial mass (g)} \times \text{Percent dry matter}} \times 100$$

ANNEX D
[Table 1, Sl No. (vi)]

GROSS ENERGY

Gross energy in raw materials and finished carp feeds can be either directly estimated by bomb calorimeter (Method D-1) or calculated by Physiological Fuel Values (Method D-2) and the detailed procedures are given below

D-1 DETERMINATION OF GROSS ENERGY

The bomb calorimeter provides a means of assessing the amount of energy (gross) made available during the catalytic degradation of combustible solids, liquids and gases in a pressurized oxygen atmosphere. Gross energy is the amount of heat liberated when a substance is completely burnt to carbon dioxide and water. It is also known as heat of combustion.

D-1.1 Preparation of Sample Material

It is essential that the test sample is truly representative of the sample material. In general the sample material needs to be dried before combustion and here the sample characteristics will determine the method of drying to be used that is whether oven drying or vacuum drying at low temperature should be done before or after selection of a working sample. The drying process should not volatilize or destroy any of the combustible material. If complete dryness cannot be achieved easily without loss, preliminary tests should be made to determine the maximum water content at which this sample material can be ignited and completely burnt in the bomb. All material which have low bulk density and high surface area must be compacted.

D-2 PRINCIPLE

A known quantity of a sample is ignited electrically and burnt in excess of oxygen in the bomb. The maximum temperature rise is measured with the thermometers in a controlled system. By comparing this rise with that obtained when a sample of known calorific value is burnt, the calorific value of the sample material can be determined.

D-3 APPARATUS

D-3.1 Adiabatic Bomb Calorimeter

D-3.2 Pellet Press

D-3.3 Metallic Crucible

D-3.4 Hot Air Oven

D-3.5 Balance

D-3.6 Fuse Wire

D-3.7 Cotton Thread

D-3.8 Beaker

D-3.9 Burette

D-3.10 Pipette

D-3.11 Whatman Filter Paper No. 1

D-4 REAGENTS

D-4.1 Benzoic Acid (Calorimeter Grade, Gross Energy Content 6 318 cal/g)

D-4.2 Distilled Water

D-4.3 Oxygen Gas

D-4.4 Barium Hydroxide

D-4.5 Sodium Carbonate

D-4.6 Hydrochloric Acid

D-4.7 Methyl Red Indicator

D-4.8 Phenolphthalein Indicator

D-5 PROCEDURE

D-5.1 Determination of Bomb Equivalent

- a) Take about 0.35 g of benzoic acid and make a pellet with the help of a pellet press;
- b) Place the pellet in a pre-weighed metallic crucible. Weigh the pellet and crucible accurately;
- c) Put the bomb top on the stand. Thread a piece of fuse wire through the electrodes and tie a single strand of cotton to it. Keep the lengths of fuse wire and cotton thread constant in order to facilitate the calculation of caloric value;
- d) Swing the crucible into position, clamp the ring and arrange the ends of the cotton thread so that they are in contact with the sample;

- e) Pipette 1 ml of distilled water into the bomb;
- f) Place the electrode assembly into the bomb body ensuring that it fits correctly;
- g) Tighten the bomb closure ring by hand only;
- h) Fill the bomb to 25 atmospheric pressure with oxygen (oxygen must be free from hydrogen);
- j) Fill water into calorimetric vessel to submerge the bomb completely. The vessel and water should give a total mass of 3 kg. The quantity of water used is not critical but it must be constant for all tests to an accuracy of ± 0.5 kg;
- k) Place the bomb on three supports in the calorimeter vessel and check for the gas leakage that the bomb should not show any sign of gas leakage.
- m) Gently slide the top of the calorimeter console onto the bomb. Switch on the main and press down the bomb firing plug to contact the bomb.
- n) Adjust the initial temperature and press the fire switch.
- p) After 8 min read the temperature on main thermometer. Note final temperature when it stabilizes.

D-5.1.1 Calculation

$$\text{Bomb equivalent} = \frac{(6\,318 \times M) + A}{T}$$

where

M = mass of benzoic acid (g);

A = correction factor for wire and thread [heat of combustion of thread and wire may be taken as 3 962 cal/g and 1 400 cal/g (or 2.3 cal/cm) respectively]; and

T = rise in temperature ($^{\circ}\text{C}$).

D-5.2 Gross Energy Estimation of Feed

Weight 0.5-1 g of finely ground representative sample and make a pellet with the help of pellet press. All the materials which have low bulk density and high surface area must be compacted to reduce their rate of combustion, or otherwise, it will lead to a false result due to loss of sample from the crucible, even more serious is the possibility that the combustion will be so rapid that it resembles an explosion. Weigh samples for dry matter determination at the time of pelleting. Put

the pellet in a pre-weighed crucible and weigh again. Follow the steps (c) to (p) as described in **D- 5.1**. Switch off the main switch. Remove the bomb from the vessel. Release pressure of the bomb using pressure release cap. Open the bomb and wash the electrodes and inside top and body of the bomb with distilled water. Collect these washing in a beaker for corrections for nitrogen and sulphur contents.

D-5.2.1 Calculation

$$\text{Gross energy (cal/g)} = \frac{(\text{Bomb equivalent} \times T) - A}{\text{Dry mass of sample (g)}}$$

where

T = rise in temperature; and

A = correction factors for wire, thread, nitrogen and sulphur.

D-5.3 Nitrogen and Sulphur Corrections

- a) Boil the washings (see D-5.2) collected in the beaker for 5 min;
- b) Cool and titrate against N/10 Ba(OH)_2 solution using phenolphthalein indicator;
- c) Add 20 ml of N/10 Na_2CO_3 solution and boil again.
- d) Cool the contents and filter through Whatman filter paper No. 1 and give 2-3 washings with hot distilled water;
- e) Titrate the washings against N/10 HCl using methyl orange indicator; and
- f) Heat liberated due to production of H_2SO_4 and HNO_3 can be calculated by using the following factors:

1 ml of N/10 Ba(OH)_2 solution = 3.60 cal

1 ml of N/10 Na_2CO_3 solution = 1.43 cal

D-5.3.1 Calculations

Nitric acid correction (cal) = $1.43 (B - C)$

Sulphuric acid correction (cal) = $3.60 [A - (B - C)]$

where

A = amount of N/10 Ba(OH)_2 solution used (ml);

B = amount of N/10 Na_2CO_3 solution added (ml);
and

C = amount of N/10 HCl used (ml).

D-2: CALCULATION OF GROSS ENERGY

Moisture, crude protein, crude fat, crude fibre, and total ash in the carp feed may be estimated as per the test methods referred in the table 1. Nitrogen free extractives (NFE) which represents the available carbohydrate portion of the feed material shall be calculated as below:

Nitrogen free extractives = $100 - (\% \text{ Moisture} + \% \text{ Crude Protein} + \% \text{ Crude Fat} + \% \text{ Crude Fibre} + \% \text{ Total Ash})$.

Based on the protein, fat and carbohydrate, the heat of combustion can be calculated and the gross energy equivalent of the test sample can be estimated. The Physiological Fuel Value (gross energy equivalent) for Crude Protein, Crude Fat and Nitrogen free extractives shall be 5.65 kcal/g, 9.45 kcal/g and 4.2 kcal/g, respectively and the Gross Energy of the feed in kcal/kg shall be calculated as given below:

Gross Energy of the feed (kcal/kg) = $(\text{crude protein (g/kg)} \times 5.65) + (\text{crude fat (g/kg)} \times 9.45) + (\text{NFE (g/kg)} \times 4.2)$

ANNEX E*(Foreword)***COMMITTEE COMPOSITION**

Fish, Fisheries and Aquaculture Sectional Committee, FAD 12

<i>Organization</i>	<i>Representative(s)</i>
Indian Council of Agricultural Research, New Delhi	DR JOY KRUSHNA JENA (Chairperson)
All India Shrimp Hatchery Association, Hyderabad	SHRI D. RAMRAJ SHRI K. MADHUSUDAN REDDY (<i>Alternate</i>)
Central Agricultural University, Imphal	DR R. K. MAJUMDAR
Central Institute of Fisheries Education, Mumbai	DR GOPAL KRISHNA DR B. B. NAYAK (<i>Alternate</i>)
Coastal Aquaculture Authority, Chennai	SHRI ANTONY A. XAVIER
Defence Food Research Laboratory, Mysore	DIRECTOR
Export Inspection Council of India, New Delhi	SHRI R. M. MANDALIK
Food Safety and Standards Authority of India, New Delhi	DR A. K. MISHRA MS ANJU KAVI (<i>Alternate</i>)
ICAR - Central Inland Fisheries Research Institute, Kolkata	DR DHARMENDRA KUMAR MEENA DR BIJAY KUMAR BEHERA (<i>Alternate</i>)
ICAR-Central Institute for Fisheries Technology, Kochi	DR SATYEN KUMAR PANDA DR C. O. MOHAN (<i>Alternate I</i>) DR T. V. SANKAR (<i>Alternate II</i>)
ICAR-Central Institute of Brackish Water Aquaculture, Chennai	DR K. AMBASANKAR DR SUBHENDU KUMAR OTTA (<i>Alternate I</i>) DR P. K. PATIL (<i>Alternate II</i>)
ICAR-Central Institute of Fresh Water Aquaculture, Bhubaneswar	DR P. C. DAS DR KEDAR NATH MOHANTA (<i>Alternate</i>)
Marine Products Export Development Authority, Kochi	DR RAM MOHAN M. K. SHRI V. VINOD (<i>Alternate</i>)
National Fisheries Development Board, Hyderabad	DIRECTOR
National Institute of Fisheries Post Harvest Technology and Training, Ernakulam	DR JAI SINGH MEENA SHRI VARGHESE JOHN (<i>Alternate</i>)
Seafood Exporters Association of India, Kochi	SHRI NORBERT KARIKKASSERY
Society of Aquaculture Professional, Chennai	SHRI RAVIKUMAR YELLANKI SHRI P. K. SENTHIL KUMAR (<i>Alternate</i>)
BIS Directorate General	SHRIMATI. SUNEETI TOTEJA, SCIENTIST 'E'/DIRECTOR AND HEAD (FOOD AND AGRICULTURE DEPARTMENT) [REPRESENTING DIRECTOR GENERAL (<i>Ex-officio</i>)]

Member Secretary

SHRIMATI NAVITA YADAV
SCIENTIST 'D'/JOINT DIRECTOR
(FOOD AND AGRICULTURE DEPARTMENT), BIS

IS 16150 (Part 1) : 2023

FAD 12/Panel II, Expert Panel for Review and Revision of Indian Standards on Fish Feed

<i>Organization</i>	<i>Representative(s)</i>
ICAR-Central Institute of Brackishwater Aquaculture, Chennai	DR K. AMBASANKAR (Convenor)
ICAR-Central Institute Of Freshwater Aquaculture, Bhubaneswar	DR S. S. GIRI
Society Of Aquaculture Professionals, Chennai	SHRI VICTOR SURESH

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